

## CLAIMS

What is claimed is:

1. A method for chemical treatment of biological tissue, comprising the steps of:
  - 5 (a) providing a quantity of biological tissue which contains connective tissue protein; and,
  - (b) contacting the biological tissue with a solution under oxidizing conditions for sufficient time to impart enhanced stability compared to traditional means of fixing connective tissue protein
- 10 within the biological tissue.
2. A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by heating the solution in the presence of oxygen.
- 15 3. A method according to Claim 2 wherein the presence of oxygen is provided by ambient oxygen in the solution.
- 20 4. A method according to Claim 2 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas solution.
5. A method according to Claim 2 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.
- 25 6. A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by combining an oxidizing agent with the solution in the presence of oxygen.
- 30 7. A method according to Claim 6 wherein the oxidizing agent is selected from the group of oxidizing agents consisting of a peroxide, a compound containing peroxide, hydrogen peroxide, a periodate, a compound containing periodate, sodium periodate, a

diisocyanate compound, a halogen, a compound containing halogen, n-bromosuccinimide, a permanganate, a compound containing permanganate, ozone, a compound containing ozone, chromic acid, sulfonyl chloride, a sulfoxide, a selenoxide, and combinations thereof.

5        8. A method according to Claim 6 wherein the presence of oxygen is provided by ambient oxygen in the solution.

9. A method according to Claim 6 wherein at least some of the oxygen present is provided by allowing the solution-oxidizing agent mixture to contact atmospheric air, 10 oxygen or an oxygen-containing gas mixture.

10.      A method according to Claim 6 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

15        11.      A method according to Claim 1 wherein the oxidizing conditions are provided in step (b) by irradiating the solution in the presence of oxygen.

20        12.      A method according to Claim 11 wherein the solution is irradiated by a type of radiation energy selected from the group of alpha ionizing radiation, beta ionizing radiation, ultraviolet radiation, electron beam radiation, gamma rays, and combinations thereof.

13.      A method according to Claim 11 wherein the presence of oxygen is provided by ambient oxygen in the solution.

25        14.      A method according to Claim 11 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas mixture.

15. A method according to Claim 11 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

16. A method according to Claim 1 wherein the solution is flowing.

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17. A method according to Claim 16 wherein the flowing of the solution is effected by placing the solution and the tissue in a container, wherein the solution is heated and circulated through the container.

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18. A method according to Claim 1, wherein step (b) comprises the steps of:

placing the tissue in a solution containing 0.2-2.0 % glutaraldehyde;

maintaining the glutaraldehyde solution at 25-70 °C for a period of 0.5-60 days; and,

removing the tissue from the glutaraldehyde solution.

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19. A method according to Claim 18 wherein the solution has a glutaraldehyde concentration of about 0.625%.

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20. A method according to Claim 19 wherein the 0.625% glutaraldehyde solution is maintained at about 45-55 °C for a period of between about 7 and 14 days.

21. A method according to Claim 1 wherein the solution is a fixative.

22. A method according to Claim 21 wherein fixative is glutaraldehyde.

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23. A method according to Claim 21 wherein fixative is Denacol.

24. A method according to Claim 1 wherein the solution is peroxide.

25. A bioprosthetic comprising tissue that has been prepared by a method comprising the steps of:

- (a) providing a quantity of biological tissue which contains connective tissue protein; and,
- 5 (b) contacting the biological tissue with a solution under oxidizing conditions for sufficient time to result in crosslinking of connective tissue protein within the biological tissue.

26. A bioprosthetic according to Claim 25 wherein the oxidizing conditions in  
10 step (b) are provided by heating the solution in the presence of oxygen.

27. A bioprosthetic according to Claim 25 wherein the presence of oxygen in step (b) is provided by ambient oxygen in the solution.

15 28. A bioprosthetic according to Claim 25 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas solution.

20 29. A bioprosthetic according to Claim 25 wherein at least some of the oxygen present in step (b) is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

25 30. A bioprosthetic according to Claim 25 wherein the oxidizing conditions are provided in step (b) by combining an oxidizing agent with the solution in the presence of oxygen.

30 31. A bioprosthetic according to Claim 30 wherein the oxidizing agent is selected from the group of oxidizing agents consisting of a peroxide, a compound containing peroxide, hydrogen peroxide, a periodate, a compound containing periodate, sodium periodate, a diisocyanate compound, a halogen, a compound containing halogen, n-

bromosuccinimide, a permanganate, a compound containing permanganate, ozone, a compound containing ozone, chromic acid, sulfuryl chloride, a sulfoxide, a selenoxide, and combinations thereof.

5        32.     A bioprosthesis according to Claim 30 wherein the presence of oxygen is provided by ambient oxygen in the solution-oxidizing agent mixture.

10      33.     A bioprosthesis according to Claim 30 wherein at least some of the oxygen present is provided by allowing the solution-oxidizing agent mixture to contact atmospheric air, oxygen or an oxygen-containing gas mixture.

15      34.     A bioprosthesis according to Claim 30 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

15      35.     A bioprosthesis according to Claim 25 wherein the oxidizing conditions are provided in step (b) by irradiating the solution in the presence of oxygen.

20      36.     A bioprosthesis according to Claim 35 wherein the solution is irradiated by a type of radiation energy selected from the group consisting of: alpha ionizing radiation, beta ionizing radiation, ultraviolet radiation, electron beam radiation, gamma rays, and combinations thereof.

25      37.     A bioprosthesis according to Claim 35 wherein the presence of oxygen is provided by ambient oxygen in the solution.

30      38.     A bioprosthesis according to Claim 35 wherein at least some of the oxygen present is provided by allowing the solution to contact atmospheric air, oxygen or an oxygen-containing gas mixture.

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39. A bioprosthesis according to Claim 35 wherein at least some of the oxygen present is provided by bubbling oxygen or an oxygen-containing gas mixture through the solution.

5 40. A bioprosthesis according to Claim 25 wherein the solution is flowing.

41. A bioprosthesis according to Claim 40 wherein the flowing of the solution is effected by placing the solution and the tissue in a fixation container, wherein the solution is heated and circulated through the container.